

FIVE NEW SPECIES OF HALFBEAKS (HEMIRAMPHIDAE)
FROM THE INDO-WEST PACIFIC

Bruce B. Collette and N. V. Parin

Abstract.—*Hemiramphus marginatus* (Forsskal) is confined to the Red Sea and Persian Gulf. The species that has been confused with it in the Indian Ocean and western Pacific Ocean is described as *Hemiramphus archipelagicus* n. sp. It differs from *He. marginatus* in having the lower jaw longer than the head instead of vice versa. It is similar to the Atlantic *He. brasiliensis* (Linnaeus) but has fewer gill rakers and anal fin rays. Four new species are described in *Hyporhamphus*, three in the subgenus *Hyporhamphus* and one in the subgenus *Reporhamphus*. *Hy. (R.) yuri* n. sp. is restricted to Okinawa. It resembles *Hy. dussumieri* (Valenciennes) and *Hy. affinis* (Günther) but has more vertebrae and a longer preorbital distance. *Hy. (Hy.) melanopterus* n. sp. is the halfbeak with prominent black spots in the dorsal fin and upper and lower caudal lobes that has been misidentified as *Hy. melanurus* (Valenciennes) which is a synonym of *Hy. quoyi* (Valenciennes). *Hy. (Hy.) paucirastris* n. sp. from the South China Sea differs from other Indo-Pacific species of the subgenus in the low number of gill rakers on the first arch (19–21) and high number of vertebrae (54–55). *Hy. (Hy.) unicuspis* n. sp. from India and the Andaman Sea resembles *Hy. knysnaensis* (Smith) from South Africa and *Hy. sindensis* (Regan) from the Persian Gulf and Arabian Sea in several characters. It is similar to *Hy. knysnaensis* in having unicuspid teeth but differs in having the pelvic fins located more anteriorly.

While preparing a review of the tropical marine halfbeaks of the Indo-West Pacific, we have discovered several species that are undescribed or that lack available names. We present here the formal descriptions of new taxa in advance of the review. The genus-group name *Reporhamphus* Whitley is used for a subgenus of *Hyporhamphus* containing those species with a posterior branch to the preorbital canal (see Collette, 1974: fig. 2) and a deeply forked caudal fin. The subgenus *Hyporhamphus* is restricted to those species that lack a posterior branch to the preorbital canal (see Collette, 1974: fig. 1) and have an emarginate caudal fin. Methodology is similar to that in previous papers that we have published on the Hemiramphidae (e.g., Collette, 1974, 1976; Parin and Shcherbachev, 1972). Material examined is in the following collections: AMS—Australian Museum, Sydney; ANSP—Academy of Natural Sciences, Philadelphia; BMNH—British Museum (Natural History), London; CAS—California Academy of Sciences, San Francisco; DASF—Department of Agriculture, Stock, and

Fisheries, Port Moresby, Papua-New Guinea; FMNH—Field Museum of Natural History, Chicago; IO—P. P. Shirshov Institute of Oceanology, Moscow; KUB—Kasetsart University, Bangkok; MCZ—Museum of Comparative Zoology, Harvard University, Cambridge, Mass.; MNHN—Muséum National d'Histoire Naturelle, Paris; NHMV—Naturhistorisches Museum, Vienna; NMC—National Museum, Vienna; NMC—National Museum of Canada, Ottawa; RMNH—Rijksmuseum van Natuurlijke Historie, Leiden; SU—Stanford University (specimens now at CAS); UMMZ—University of Michigan Museum of Zoology, Ann Arbor; USNM—National Museum of Natural History, Washington, D.C.; ZMA—Zoological Museum, Amsterdam; ZIN—Zoological Institute, Leningrad; ZMUC—Zoological Museum, University of Copenhagen; ZSI—Zoological Survey of India, Calcutta.

Hemiramphus archipelagicus, new species

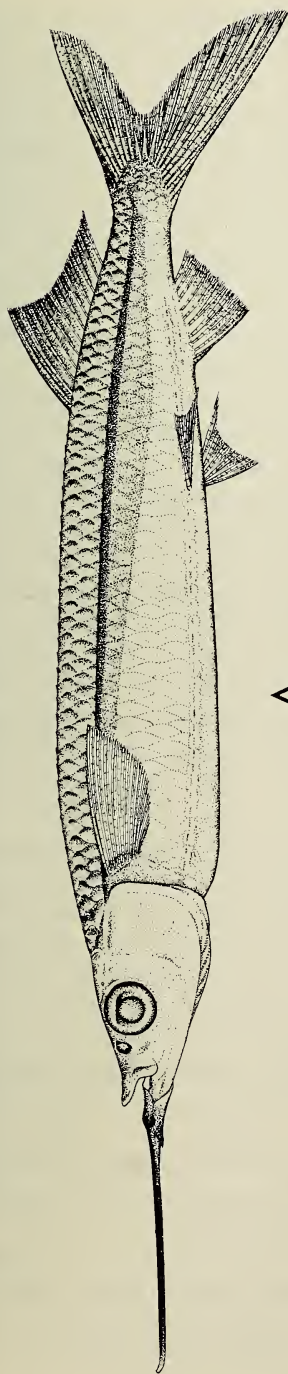
Fig. 1a

Hemiramphus marginatus not of Forsskal. Bleeker, 1886:148–150 (in part; description, Batavia). Günther, 1866:270 (in part; description, BMNH 1866.5.2.15 from Bleeker's collection). Bleeker, 1871:54–55 (in part; description, Batavia, color plate 254, fig. 4). Weber and de Beaufort, 1922:157–159 (in part; description, Batavia).

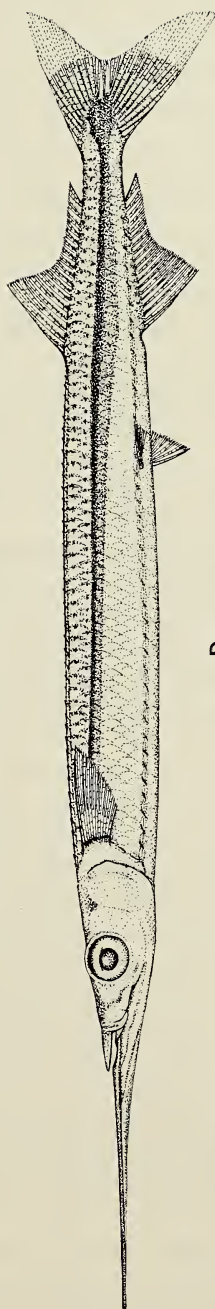
Hemiramphus marginatus not of Forsskal. Fowler, 1927:263 (Orani, Bataan, Philippine Islands, ANSP 55967–70). Fowler, 1935:130 (Bangkok and Paknam, Thailand, ANSP 61618–24). Herre, 1944:15 (only SU 33938 from Pinang, Malaya).

Diagnosis.—*Hemiramphus archipelagicus* is a member of the group of species in the genus with short pectoral fins (pectoral fin, when extended forward, not reaching beyond the nasal fossa). It differs from *He. far* (Forsskal) and *He. robustus* Günther in the absence (in adults) of bars or spots on the body, the absence of an anterior lobe of the dorsal fin, and the presence of pigment along the entire margin of the dorsal fin. The banded juveniles of *H. archipelagicus* have a shorter head than do equal-sized *He. far*. *He. archipelagicus* differs from the allopatric *He. marginatus* in having the lower jaw longer than the head instead of vice versa. *He. archipelagicus* is similar to *He. brasiliensis* (Linnaeus) from the Atlantic in many respects (see Collette, 1962, 1965) but has fewer anal fin rays (11 or 12 instead of 13 or 14) and averages slightly fewer gill rakers on both the first and second arches.

Brief description (based on specimens 147–220 mm long).—Head 4.1–4.5 times in SL, proportionally increasing with age. Lower jaw 3.1–3.4 times in SL and 0.7–0.8 times in head length. Interorbital distance slightly greater than diameter of eye. Gill rakers on first arch (6–8) + (19–24) = 25–32, on second arch (4–6) + (15–21) = 20–25. Teeth small, distributed in 3–4



A



B

Fig. 1A. *Hemiramphus archipelagicus* n. sp. Collette and Parin, holotype, USNM 218371, mature male, 190 mm SL; 8°21'N, 104°38'E; Dodo sta. 264; 10 Nov. 1965; T. Matsui. 1B. *Hyporhamphus (Reporhamphus) yuri* n. sp. Collette and Parin, holotype, USNM 218481, 168 mm SL; Okinawa, Naha market; 1906; J. O. Snyder.

rows on both jaws. Greatest body width 1.8–2.0 times in its depth. Vertebrae (34–37) + (16–17) = 50–54, usually 52–54. Predorsal scales 32–34, usually 34–36.

D 11–15, usually 13 or 14; A 10–13, usually 11 or 12. D-A = -1 to 3, usually 1 or 2. Dorsal fin without well-developed anterior lobe. Anal fin originates under 4–5th ray of dorsal, its base contained 1.55–1.8 times in the base of the dorsal. Anterior rays of dorsal (to 2–3rd ray) and anal (to 2–4th ray) fins covered with scales. P_1 11–12(13). Length of pectoral fins 5.8–6.8 times in SL, not exceeding distance between origin of fin and posterior margin (rarely middle) of nasal fossa. Pelvic fins located significantly closer to origin of lower lobe of caudal fin than to origin of pectoral fin (P_1 – P_2 / P_2 –C 1.35–1.55). Length of pelvic fins 9.0–10.5 times in SL.

Dark stripe present along the sides of the body, widening under dorsal fin. No spots present on sides of body. Dorsal fin pigmented only on its edge but inner parts of membranes transparent. Caudal fin gray, darker along the edges; anal, pectoral and pelvic fins transparent (in a specimen 148 mm SL, pigmentation present on posterior part of anal fin and inner part of pelvic fin).

Description of juveniles (based on 27 juvenile He. archipelagicus 24–115 mm long).—Head length contained 4.0–4.3 times in SL; pelvic fins reach or almost reach origin of anal, their length contained 6.3–7.4 times in SL; length of pectoral fins not exceeding distance between their origin and anterior margin of nasal fossa (usually less than this distance); posterior rays of dorsal fin extend to origin of upper lobe of caudal fin or almost reach it; width of body contained 1.55–2.0 times in SL; interorbital distance less than diameter of eye or equal to it.

On the sides of the body are 3–10 more or less well developed transverse bands (in specimens 115 mm SL almost not visible), almost always extending onto belly. Pigmentation present in preorbital region and behind eyes. Dorsal fin in small juveniles completely pigmented, particularly dense in posterior part, at more than 70 mm SL colored, as in adults, only on the margin; anal fin at 30–70 mm SL completely pigmented, at larger sizes pigment retained only on posterior parts; pectoral fin transparent; pelvic densely pigmented at less than 65 mm SL, at larger sizes beginning to clear along inner edge; caudal fin with dark bases, 2–4 bands on lower lobe and 1–2 bands on upper.

Size.—Females are mature by 194 mm SL, males by 168 mm (USNM 218372, Gulf of Thailand). Maximum length (227 mm) registered in a specimen collected at Manado, Celebes Is. (BMNH 1871.6.18.7).

Distribution.—The range of *He. archipelagicus* extends from the western part of the Indian Ocean to the western islands of Polynesia but most records are concentrated in the Indo-Australian Archipelago and the Gulf of Thailand. *He. archipelagicus* adults usually are found near coasts but juve-

niles may be found further offshore associated with floating plants. Most of the records of *He. marginatus* from the Indian Ocean and western Pacific in the literature that we have been able to check apply to the long pectoral-finned species *He. lutkei* Valenciennes, a valid species that has been improperly synonymized with *He. marginatus*. All that we have examined (85 specimens at SU, FMNH, UMMZ, BMNH) of the material reported by Herre (1944 and 1953) from the Philippines as *He. marginatus* is *He. lutkei*. Fowler's 1927 report of *He. marginatus* from Bataan is the only published verifiable record of *He. archipelagicus* from the Philippines. Most records of *He. marginatus* from farther east in the Pacific islands, for example the Gilbert Islands (Whitley and Colefax, 1938, AMS IA.6994) and the Marianas Islands (Woods and Schultz, 1953, USNM 123395, 132848), should be attributed to *He. lutkei*.

Remarks.—This species has frequently been reported in the literature as *He. marginatus* (Forsskal) but that species has a short lower jaw and is confined to the Red Sea and Persian Gulf.

Etymology.—The name *archipelagicus* (from the Latin *arcus*, arch and *pelagicus*, pelagic) is selected in reference to the center of distribution of the species around the islands of the Indo-Australian Archipelago.

Holotype.—USNM 218371; 8°21'N, 104°38'E; Dodo sta. 264; 10 Nov. 1965; T. Matsui et al., mature male; 190 mm SL; D 13, A 11, P₁ 12; RGR₁ 6 + 21 = 27, RGR₂ 4 + 16 = 20; predorsal scales 36; vertebrae 37 + 15 = 52; head length 44.2 mm; lower jaw length 54.1 mm; pectoral fin length 30.1 mm; pectoral fin length projected forward falls on anterior margin of orbit.

Paratypes.—103 specimens from the Gulf of Thailand, Vietnam, and East Indies.

Gulf of Thailand. Bangkok uncat. (10, 143–202); Thailand, Khan Prov., Prachaubkiri; 14 Dec. 1965. ZSI F 1224/2 (2, 190–220); Thailand, Kilin-gimedu, 3.5 mi N Karaikkal; A. G. K. Menon; 9 Feb. 1957. UMMZ 181212 (1, 150); Cambodia, Kas Kong Prov., Kas Kapik; J. Bardach; 6 March 1959. CAS GVF 2398 (1, 181); 7°22'00"N, 100°43'30"E; 9 Aug. 1960. CAS uncat. (1, 155); Thailand sta. 60–464, SIO 61–156, CN 855A, Cruise S-10; M/V Stranger; 12 Feb. 1961. ANSP 61624 (1, 165); Paknam; R. M. de Schauensee; 28 Aug. 1934. ANSP 6618–23 (6, 155–183); Bangkok; R. M. de Schauensee; May 1934. CAS 38631 (1, 167); off Songkhla; 7°15'30"N, 100°36'15"E; M/V Stranger; GVF Reg. 2020; 20 Jan. 1960; R. Bolin. CAS 38632 (4, 183–212); Chumphon Prov., off Langsuan; GVF Reg. 2594; 19 May 1961.

Vietnam. ZMUC P-341250–51 (2, 181–183); 9°59'N, 107°23'E; Dana sta. 3692.

East Indies, 74 specimens (24.2–227 mm SL) from 35 collections. MCZ 704 (1, 177); East Indies; Putnam. NMC 63–290 (1, 181); Singapore market; C. C. Lindsey; Dec. 1962–April 1963. NMC 63–287 (2, 162–186); Malaysia,

Johore, Maar market; C. C. Lindsey; Feb.–March 1963. ZMUC uncat. (1, 181); Batavia market; T. Mortenson; Sept. 1922. ZMUC 142 (1, 170); Penang; Galathea 141. BMNH 1866.5.2.15 (1, 172); East Indies; Bleeker purchase. BMNH 1871.6.18.7 (1, 227); Celebes, Manado; Meyer. ZMA 114.585 (1, 173); Sumatra, Deli; DeBassy. ZMA 114.586 (1, 155); Reede van Pekalongan; Buitendijk; Oct. 1912. ZMA 114.587 (1, 173); Suribaya, Westgut; K. Haasnoot; 1912. ZMA 114.588 (1, 95.3); Baai van Batavia; Buitendijk; Dec. 1910. ZMA 114.589 (2, 100–169); Ind. Arch.; Bleeker. RMNH 4729 (1, 178); Batavia; Bleeker; 1852–60. RMNH 12191 (2, 141–148); East Indies; Bleeker. RMNH 12190 (7, 168–207); Batavia; Bleeker. NHMV 15893 (1, 187); Batavia; Pietschman; Aug. 1929. RMNH 12188 (1, 173); Java Sea; Buitendijk; Oct. 1910. RMNH 12185 (2, 173–189); Java Sea; Buitendijk; May 1907. RMNH 12182 (3, 157–166); Java Sea; Buitendijk. RMNH 12184 (4, 106–160); Java Sea; Buitendijk; 3 Feb. 1915. RMNH 12186 (2, 96.0–142); Java Sea; Buitendijk. RMNH 12187 (2, 84.1–102); Java Sea; Buitendijk; Aug. 1905. RMNH 12183 (1, 180); Baai van Batavia; Jan. 1916. RMNH 12181 (6, 144–175); Reede van Samarang; Buitendijk; 1912. FMNH 15805–6 (2, 118–129); Java, Batavia; Chancellor-Stuart-Field Mus. Exped.; 1929. RMNH 12180 (2, 55.9–84.5); Java, Reede van Samarang; Buitendijk; Nov. 1915. ZMUC uncat. (3, 40.7–62.5); 4°30'N, 103°28'E; Galathea 373; 6–7 June 1951. ZMA 114.602 (4, 28.9–50.6); Java, Reede van Samarang; Buitendijk; 1902. ZMA 114.601 (5, 24.2–45.8); Java, Reede van Samarang; Buitendijk; Jan. 1914. ZMA 114.600 (1, 39.2); E. Java, Reede van Panarukan; Buitendijk; 2 Aug. 1911. ZMUC P-341743 (1, 56.6); NE of Singapore; 1°46'N, 104°25'E; Galathea 399; 21 June 1951. IO uncat. (1, 200); Djarkarta; Vityaz unnumbered sta. IO uncat. (1, 152); Singapore. IO uncat. (1, 81); Suribaya; Nora unnumbered sta. IO uncat. (6, 57–95); NE of Singapore; 1°58'N, 105°53'E; Vityaz sta. 6487; 13 June 1971. IO uncat. (1, 103); Banda Sea; 5°45'S, 131°30'E; Vityaz sta. 6782; April 1973.

Other material.—Specimens (29, 33–220) from the extremes of the range (Indian Ocean, New Guinea, the Philippine Islands and Polynesia) are not designated paratypes.

Indian Ocean. Phuket 1028–30 (2, 189–202); India, off Cochin; 1 Sept. 1972. Biol. Ans. Helgoland IOES 69 (2, 98.9–105); 10 n. mi W of Goa; Meteor sta. 193; 15 Feb. 1964. ZMUC uncat. (1, 140); S. Malacca; M. Jensen; 9 Oct. 1901. ZIN uncat. (8, 65–220); Bay of Bengal; 20°55'N, 88°02'E; Ob sta. 329; 14 May 1957.

New Guinea. USNM 212041 (1, 158); W. Irian, McCluer Gulf; 1°31.1'S, 130°34'E; J. E. McCosker 72–4; 17 Dec. 1972. DASF uncat. (2, 33–35); Sek Harbor. IO uncat. (2, 83–97); Port Moresby; Dmitry Mendeleev unnumbered sta.; 18 Jan. 1977. IO uncat. (1, 79); Admiralty Is., St. Andrew; Dmitry Mendeleev unnumbered sta.; 31 Jan. 1977. IO uncat. (1, 74); Astrolabe Bay; 5°22'S, 146°20'E; Dmitry Mendeleev unnumbered sta.; 13 Feb. 1977.

Philippine Is. ANSP 55967-70 (4, 144-161); Luzon, Bataan Province, Orani; J. Clemens; 28 April 1923. ZIN 4819 (2, 205-206); Philippine Is.

Polynesia. IO uncat. (2, 111-115); Samoa, Apia; Vityaz unnumbered sta. IO uncat. (1, 54); Tonga Is., Nukualofa; Dmitry Mendeleev unnumbered sta.; 10 March 1977.

Hyporhamphus (Reporhamphus) yuri, new species

Fig. 1b

Hemiramphus sp. Snyder, 1913:494 (badly damaged specimens from Naha market may be *H. pacificus*).

Diagnosis.—*Hy. yuri* resembles *Hy. dussumieri* (Valenciennes) and *Hy. affinis* (Günther) in general appearance and in the shape of the preorbital canal but differs from these species in having more vertebrae (59-61 vs. 53-59) and predorsal scales (43-46 vs. 37-43), a longer upper jaw (upper jaw width in length 0.87-0.96 vs. 0.6-0.85), and a greater preorbital distance (contained 1.09-1.17 times in orbit length vs. 1.35-1.65 times in *Hy. affinis* and 1.7-2.15 times in *Hy. dussumieri*). *Hy. yuri* has about the same number of gill rakers (RGR_1 36-42, RGR_2 25-30) as *Hy. dussumieri* (35-44, 27-33), and more than *Hy. affinis* (28-38, 20-28). *Hy. yuri* averages higher dorsal and anal fin ray counts than *Hy. affinis* and *Hy. dussumieri* but there is extensive overlap. The high vertebral count in *Hy. yuri* is comparable to the Australian *Hy. melanochir* (Valenciennes) which has a range of 55-61. In upper jaw length, *Hy. yuri* overlaps *Hy. acutus* (Günther) and the three temperate species from Australia and New Zealand—*Hy. australis* (Steindachner), *Hy. melanochir*, and *Hy. ihi* Phillipps, which have a range of 0.8-1.1. In preorbital distance, *Hy. yuri* is closest to *Hy. balinensis* (Bleeker) which also has the preorbital distance contained 1.0-1.2 times in the orbit diameter.

Brief description.—Head 4.35-4.64 times in SL. Lower jaw longer than head length, 3.7-3.8 times in SL and 0.83-0.88 times in head length (but only 2 of 9 specimens had unbroken beaks). Triangular upper jaw projection pointed, its width slightly greater than its length, contained 0.87-0.99 times in its length. Preorbital distance shorter than diameter of orbit, contained 1.09-1.17 times in orbit diameter. Preorbital distance longer than upper jaw length, contained 0.83-0.95 times in upper jaw length. Gill rakers on first arch (9-12) + (26-30) = 36-42, on second arch (4-5) + (20-25) = 25-30. Teeth in both jaws unicuspid and moderately long, a few tricuspid teeth near angle of jaws; teeth in 2 rows anteriorly, 3-4 rows posteriorly. Preorbital canal wide, greatly expanded at ventral pore; posterior branch forming an obtuse angle with anterior branch; large pore present on anterior part of canal, slightly above junction of dorsal and ventral branches. Greatest body depth 9.6-11.8 times in SL, width of body 1.0-1.4 times in its depth. Vertebrae (39-41) + (19-20) = 59-61. Predorsal scales 43-46.

D 16 or 17, A 17-18, rarely 19; D-A = -1 or -2. Anal fin originates under rays 3-4 of dorsal fin, its base contained 1.06-1.23 times in base of dorsal fin. No scales present on fins of type series but may be present in specimens in better condition. P₁ 11 or 12. Pectoral fin length 8.4-9.3 times in SL. Pelvic fins located closer to caudal base than to pectoral fin origin (P₁-P₂/P₂-C = 1.08-1.17), P₂-C distance projected forward falls on anterior or middle third of adpressed pectoral fin. Length of pelvic fins 1.7-1.8 times in SL.

A dark stripe along sides of body, widening under dorsal fin. A few scattered melanophores along distal portions of dorsal rays 2-4 or 5; other fins mostly unpigmented. Trace of pigment outlining lateral line scales, probably more prominent in fresh material.

Size.—Maximum known size 171 mm SL but probably grows larger.

Distribution.—This species is known only from the type-locality in Okinawa.

Remarks.—The nine type-specimens of *Hy. yuri* plus four specimens of *Hy. dussumieri* (now USNM 218480) were found labelled as *Hemiramphus pacificus* in the USNM collections (see Snyder, 1913:494). Schmidt's 1930 report of *Hy. dussumieri* has been verified (ZIN 23201) but Jordan and Starks' 1907 report could refer to either *Hy. dussumieri* or *Hy. yuri*.

Etymology.—Named in honor of Yuri N. Shcherbachev, P. P. Shirshov Institute of Oceanology, for his assistance with our review of the Indo-West Pacific marine halfbeaks. The name *yuri* is to be treated as a noun in apposition.

Holotype.—USNM 218481; Okinawa, Naha market; Albatross; J. O. Snyder; 1906; 168 mm SL; D 17, A 19; P₁ 12-12; RGR₁ 11 + 27 = 38, RGR₂ 5 + 28 = 33; vertebrae 41 + 19 = 60; head length 38.6 mm; lower jaw length 43.7 mm; upper jaw length 7.2 mm, width 7.5 mm; P₁-P₂ 68.9 mm, P₂-C 61.1 mm; P₂-C distance projected forward falls on middle third of adpressed pectoral fin; orbit length 8.8 mm; preorbital distance 8.1 mm.

Paratypes.—USNM 75494 (7, 140-171), and IO uncat. (1, 157), same data as holotype.

Hyporhamphus (Hyporhamphus) melanopterus, new species

Fig. 2a

Hemiramphus melanurus not of Valenciennes. Bleeker, 1852:19-20 (description, Batavia, 21 specimens). Bleeker, 1866:156-157 (description, East Indies, 23 specimens). Bleeker, 1871:58-59 (description, East Indies, color plate). Weber and de Beaufort, 1922:151-152 (description, East Indies).

Hemiramphus melanurus not of Valenciennes. Herre 1937:17 and 1944:54 (14 of 22 specimens from the Straits Settlements, SU 30753 and the largest 2 of 5 specimens from Singora, Thailand, SU 30754).

Hyporhamphus melanurus not of Valenciennes. Inger, 1957:352-354 (N. Borneo, only the 3 specimens from the Sandakan fish market, FMNH 51890).

Diagnosis.—*Hy. melanopterus* is most similar to *Hy. neglectus* (Bleeker) and *Hy. limbatus* (Valenciennes) with which it has been confused. However, it differs sharply from these species and all other species of *Hyporhamphus* in having prominent black spots on the tips of the lobes of the dorsal and caudal (both upper and lower lobes) fins. It differs from *Hy. neglectus* and *Hy. limbatus* in averaging more fin rays in the dorsal and anal fins, D:A usually 16:16 in *melanopterus*, 14-15:15-16 in *neglectus*, and 13-14:14-15 in *limbatus*. *Hy. melanopterus* has a relatively long pre-orbital distance going 1.1-1.3 times in diameter of the orbit (compared to 1.3-1.8 times in *Hy. limbatus*).

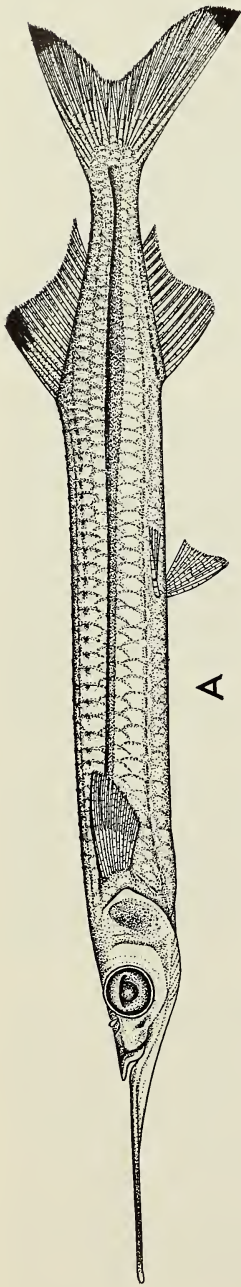
Brief description.—Head 4.4-5.1 times in SL (\bar{x} 4.74). Lower jaw 3.8-4.9 times in SL (\bar{x} 4.44) and 0.82-1.1 times in head length (\bar{x} 0.94). Triangular projection of upper jaw pointed, its width 0.60-0.73 times in its length (\bar{x} 0.67). Preorbital distance 1.1-1.3 times in orbit diameter (\bar{x} 1.18) and 0.6-0.8 times in upper jaw length (\bar{x} 0.70). Gillrakers on first arch (6-8) + (16-20) = 23-28, usually 25-26; on second arch (3-4) + (14-16) = 18-20. Teeth in jaws tricuspid, all 3 cusps about equally well-developed, in 3-4 rows in both jaws. Preorbital canal moderately wide, widening ventrally; median pore usually in center of canal. Greatest body depth 8.2-10.0 times in SL (\bar{x} 9.04). Greatest body width 1.2-1.6 times in its depth (\bar{x} 1.40). Vertebrae (31-33) + (17-20) = 49-53, usually 33 + 18 = 51. Predorsal scales 34-38.

D 14-17, usually 16; A 15-17, usually 16; D-A = -1 to 1. Anal fin base contained in dorsal base 1.0-1.4 (\bar{x} 1.08). Anterior part of dorsal and anal fins (to ray 3) covered with scales, a few scales present posteriorly at the bases of the fins. P₁ 11-12, usually 12, 13 on one side of 1 specimen. Pectoral fin length 6.8-7.5 times in SL (\bar{x} 7.18). Pelvic fins located closer to origin of pectoral fins than to base of caudal fin (P₁-P₂/P₂-C = 0.61-0.69). Pelvic fin length 11.1-12.7 times in SL (\bar{x} 11.67).

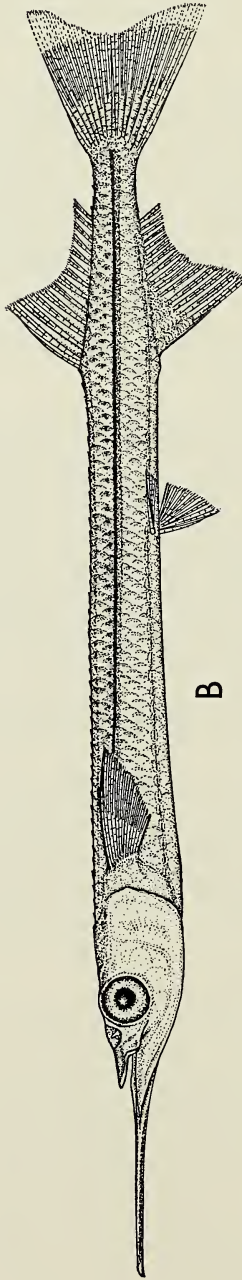
A silvery or dark stripe present along sides of body, widening under dorsal fin. Dorsal and anal fins gray with prominent black spot in dorsal lobe; caudal fin gray with prominent black spots at tips of dorsal and ventral lobes; pectoral and pelvic fins unpigmented.

Size.—Maximum known size 170 mm SL (female, East Indies, RMNH 6955). Both males and females are mature by 124 mm SL.

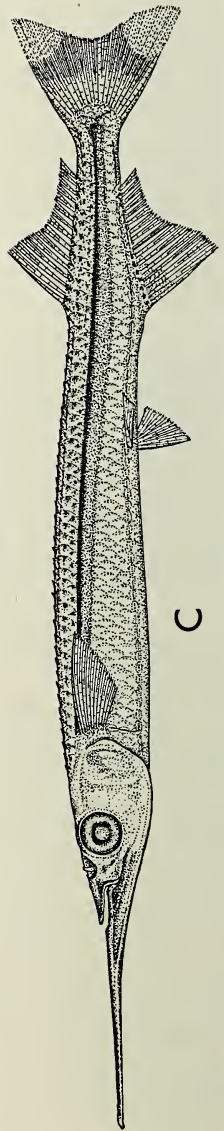
Distribution.—This species is known with certainty only from four areas—Malaysia, the Gulf of Thailand, the East Indies, and Sandakan, North Borneo. Published records of *Hy. melanurus* from other localities may be attributable to this species but, in view of the confusion of *Hy. melanop-*



A



B



C

terus with *Hy. neglectus*, *Hy. limbatus* and other species of *Hyporhamphus*, delimiting the exact range of this species will have to await the examination of more material. The specimens (FMNH 52127) reported by Jordan and Richardson (1909:177) as *He. melanurus* from Formosa are *Hy. limbatus*. The specimen (SU 29548) reported by Herre (1944:16) as *Hy. melanurus* from the Celebes is not even a member of the subgenus *Hyporhamphus* but is a juvenile *Hy. (Reporhamphus) quoyi*.

Geographic variation.—Samples from all four known areas were compared meristically and samples from the Gulf of Thailand, East Indies, and North Borneo were compared morphometrically. There does not appear to be any significant variation among the localities studied.

Remarks.—This species has been frequently reported in the literature as *Hyporhamphus* (or *Hemiramphus*) *melanurus* (Valenciennes). However, as shown by Collette (1974:81), the holotype of *He. melanurus* (MNHN B.1057, Celebes) is a specimen of *Hy. quoyi* (Valenciennes). Collette placed *melanurus* in the synonymy of *quoyi* thereby leaving this species without a name.

Etymology.—This species is named *melanopterus* in reference to the diagnostic prominent black spots in the lobes of the dorsal and caudal fins.

Holotype.—USNM 218363; N. Borneo, Sandakan Harbor; TeVega 210; D. M. Cohen and W. P. Davis; 28 Jan. 1965; female; 124 mm SL; D 16, A 17, P₁ 11–12; RGR₁ 8 + 18 = 26, RGR₂ 4 + 15 = 19; predorsal scales 38; vertebrae 32 + 19 = 51; head length 28.0 mm; lower jaw length 26.9 mm; upper jaw length 4.1 mm, width 9.1 mm; P₁–P₂ 40.0 mm, P₂–C 59.4 mm.

Paratypes.—58 specimens (80.2–170 mm SL) from 14 collections from the Gulf of Thailand, Malaysia, the East Indies, and N. Borneo.

Gulf of Thailand, 18 specimens (102–153) from 6 collections. UMMZ 191142 (1, 102); Prachuab Khiri Khan Prov., S of Klong Wan; S. Monkolprasit; 7 Dec 1963. UMMZ 191258 (2, 111–129); same locality; K. F. Lagler et al., L64-1324; 12 Dec 1964. UMMZ 191502 (8, 130–146); same locality; K. F. Lagler et al., L64-1322; 12 Dec 1964. KUB uncat. (2, 131–134); same locality; S. Monkolprasit, L64-1322; 13 Dec. 1964. KUB uncat. (3, 139–153); same locality; L64-1322. CAS SU 30754 (2, 137–148); Singora (= Songkhla); given to Herre Expedition, 1934.

←

Fig. 2A. *Hyporhamphus (Hyporhamphus) melanopterus* n. sp. Collette and Parin, paratype, KUB uncat., 134 mm SL; Gulf of Thailand, Prachuab Khiri Khan Province, south of Klong Wan; 13 Dec. 1963; S. P. Monkolprasit. 2B. *Hyporhamphus (Hyporhamphus) paucirastris* n. sp. Collette and Parin, holotype, ANSP 84959, mature male, 140 mm SL; China, Fukien Province, San-Tu; Oct. 1935; T. H. Cheng. 2C. *Hyporhamphus (Hyporhamphus) unicuspis* n. sp. Collette and Parin, holotype, USNM 218364, mature female, 120 mm SL; Thailand, southern tip of Ko Talibong; 7°12'N, 90°22'05"E; 9 Feb. 1966; V. A. Gallardo.

Malaysia, 15 specimens (80.2–127) from 2 collections. CAS SU 30753 (14, 80.2–127); Straits Settlements, Dindings, Lumut; W. Birtwistle MCZ 54059 (1, 118); Singapore; F. Putnam.

East Indies, 14 specimens (95.4–170) from 3 collections. BMNH 1866.5.2.17 (1, 133); "East Indies"; Bleeker. RMNH 6955 (12, 110–170); "East Indies"; Bleeker. RMNH uncat. (1, 95.4); Java, Semarang; P. Buitendijk; March 1902.

N. Borneo, 11 specimens (92.4–154) from 3 collections. USNM 217450 (7, 92.4–110); same data as holotype; USNM 137632 (2, 154); Sandakan; Albatross. FMNH 51890 (2, 126–131); Sandakan fish market; R. F. Inger; 1950.

Hyporhamphus (Hyporhamphus) paucirastris, new species

Fig. 2b

Diagnosis.—This species is well differentiated from all other Indo-Pacific species of the subgenus *Hyporhamphus* in the large number of vertebrae (54–55) and the low number of gill rakers on the first arch (19–21). It has a high number of predorsal scales (42–43), more than *Hy. limbatus* (Valenciennes) (30–38) and *Hy. gernaerti* (Valenciennes) (35–40) but fewer than *Hy. intermedius* (Cantor) (48–63). It has a short upper jaw (width in length 0.65–0.83), similar to *Hy. limbatus* but shorter than both *Hy. gernaerti* (0.8–1.0) and *Hy. intermedius* (1.0–1.4).

Brief description.—Head 4.7–5.0 times in SL. Lower jaw 4.7–6.3 times in SL and 1.1–1.3 times in head length. Triangular upper jaw projection somewhat pointed, its width contained 0.65–0.83 times in its length. Length of preorbital 1.4–1.75 times in diameter of orbit and 0.9–1.35 times in length of upper jaw projection. Gill rakers on first arch (5–6) + (13–16) = 19–21, on second arch 3 + (13–15) = 16–18. Upper jaw teeth tricuspid, arranged in 3–5 rows in both jaws. Preorbital canal narrow, slightly widened ventrally; median pore in center of canal or at anterior margin. Greatest body depth 9.5–10.2 times in SL, width of body 1.2–1.6 times in its depth. Vertebrae (35–37) + (18–20) = 54–55. Predorsal scales 42–43.

D 14–15, A 14–16, D–A = –2 to 0. Anal fin originating under rays 1–3 of dorsal fin, its base contained 1.1–1.2 times in base of dorsal fin. Anterior lobe of dorsal and anal fins well developed. Anterior part of dorsal (to ray 2–4) and anal (to ray 3–5) fins covered with scales. P₁ 12–13. Pectoral fin length 7.2–8.1 times in SL, equidistant from its origin to middle of eye or slightly more than this distance (but not more than distance to anterior margin of eye). Pelvic fins located slightly closer to origin of pectoral fin than to origin of lower lobe of caudal fin (P₁–P₂/P₂–C 0.85–0.95). Length of pelvic fins 10.8–19.5 times in SL.

A silvery stripe along the sides of body, widening under dorsal fin.

Dorsal and anal fins gray, without spots in lobes; caudal fin gray, slightly darker on posterior margins; pectoral and pelvic fins unpigmented.

Size.—Apparently a relatively large species, because all five known specimens are quite large (140–156 mm SL). The 156 mm specimen (ZIN 36925) is from Hainan Island.

Distribution.—All 5 specimens were collected in the basin of the South China Sea. Precise data on the locality of the two ZIN collections are absent, leaving open the question of whether this species belongs to the marine fauna (it is possible that the fish were caught in brackish or fresh water). The ANSP specimen is from San-tu, probably the same as San-tua, a coastal port in Fukien Province that formerly had a large sea trade.

Etymology.—Named *paucirastris* in reference to the diagnostically low number of gillrakers.

Holotype.—ANSP 84959; China; Fukien Province, San-Tu; T. H. Cheng; Oct. 1935; mature male; 140 mm SL; D 14, A 16, P₁ 13–13; RGR₁ 6 + 13 = 19 (right), 6 + 15 = 21 (left); RGR₂ 3 + 13 = 16 (both sides); predorsal scales 43; vertebrae 37 + 18 = 55; head length 29.6 mm; lower jaw length 27.8 mm; upper jaw length 5.3 mm, width 6.4 mm; P₁–P₂ 50.3 mm, P₂–C distance 59.4 mm, P₂–C extended forward falls on anterior third of opercle; dorsal fin base 20.8 mm; anal fin base 19.2 mm; orbit length 6.9 mm, preorbital distance 4.4 mm.

Paratypes.—Four specimens (140–156 mm SL) from two collections in the South China Sea. ZIN 8396 (2, 150–154); “Hamen”; Herz; 1888. ZIN 36925 (2, 150–156); Hainan Is.; B. E. Bykhovsky and Nagibina; 1959 (gill arches missing).

Hyporhamphus (Hyporhamphus) unicuspis, new species

Fig. 2c

Diagnosis.—This species most closely resembles *Hy. knysnaensis* (Smith) from South Africa and *Hy. sindensis* (Regan) from the Persian Gulf and north coast of the Arabian Sea in its relatively long upper jaw (upper jaw width in length 0.8–1.1 times), posterior location of pelvic fins (P₂–C distance extended forward falling posterior to the orbit), and high number of anal fin rays (16–18 in *unicuspis*, 15–17 in *knysnaensis* and *sindensis*). *Hy. unicuspis* is unusual in the subgenus *Hyporhamphus* in usually having two median pores in the preorbital canal (instead of only one) and this condition is also found in the holotype of *Hy. sindensis*. *Hy. unicuspis* resembles other Indo–West Pacific species of the subgenus and differs from *Hy. sindensis* in not having a shortened preorbital distance (preorbital distance in orbit length 1.4–1.6 in *unicuspis*, 2.0–2.7 in *sindensis*). *Hy. unicuspis* has small unicuspid teeth, thus differing from the large tricuspid teeth present in *Hy. sindensis* but further resembling *Hy. knysnaensis*. In

most other counts and measurements, *Hy. unicuspis* is similar to *Hy. knysnaensis*, but the pelvic fins are not located as far posteriorly ($P_1-P_2/P_2-C = 0.8-0.9$ in *unicuspis*, $0.9-1.0$ in *knysnaensis*; P_2-C distance projected forward falling on preopercle or opercle in *unicuspis*, on pectoral base or opercle in *knysnaensis*).

Brief description.—Head 4.1–4.6 times in SL (\bar{x} 4.36). Lower jaw 2.9–4.3 times in SL (\bar{x} 3.76) and 0.79–0.95 times in head length (\bar{x} 0.87), decreasing with growth from 0.89–0.95 times in specimens 112–142 mm SL to 0.79 and 0.65 in two specimens 84 and 73 mm SL respectively. Triangular upper jaw projection slightly pointed, its width 0.85–1.14 times in its length (\bar{x} 1.02). Length of preorbital 1.4–1.6 times in diameter of orbit (\bar{x} 1.52) and 1.2–1.5 times in length of upper jaw projection (\bar{x} 1.38). Gill rakers on first arch (9–11) + (20–23) = 30–34, gill rakers on second arch (4–6) + (17–20) = 22–26. Jaw teeth small, pointed, and unicuspid (tricuspid in posterior part of lower jaw), arranged in 3–5 rows. Preorbital canal narrow, slightly widened ventrally; two median pores in 9 of 10 specimens. Greatest body depth 7.3–12.1 times in SL (\bar{x} 10.02), body width 1.3–1.7 times in its depth (\bar{x} 1.52). Vertebrae (31–33) + (17–20) = 49–51. Predorsal scales 33–40.

D 14–16, A 16–18, D–A = –3 to –1. Anal fin originates under first or second dorsal ray or anterior to a vertical with origin of dorsal fin (origin of dorsal fin over space between 1st and 2nd anal rays), its base about equal to dorsal fin base (dorsal base divided by anal base $0.94-1.07$, \bar{x} 0.99). Anterior lobe of dorsal and anal fins poorly developed. P_1 11, rarely 10 or 12. Length of pectoral fin 7.6–8.9 times in SL (\bar{x} 8.35). Pelvic fins located noticeably closer to origin of pectoral fins than to origin of lower lobe of caudal fin ($P_1-P_2/P_2-C = 0.81-0.89$, \bar{x} 0.87). Pelvic fins 12.7–15.4 times in SL (\bar{x} 13.61).

A dark stripe present along sides of the body, widening under dorsal fin. Dorsal, anal, pectoral, and pelvic fins unpigmented; caudal fin gray, slightly darker on edges.

Size.—Reaches at least 142 mm SL (ZSI 2311/2, Madras) but it is known only from 12 specimens and may grow larger. Matures at a small size, 84 mm for males, 112 mm for females.

Distribution.—Known from southern India (Kerala on the Malabar coast, Pondicherry and Madras on the Coromandel coast), Bangladesh, and off the west coast of Thailand in the Andaman Sea. Two specimens from the Persian Gulf are considered as *Hy. unicuspis* for the present.

Geographic variation.—The 5 specimens from southern India and Bangladesh resemble the 5 specimens from Thailand in all meristic characters. However, there appear to be several morphometric characters in which the Indian specimens (73–142 mm SL) differ from the Thai specimens (84–120 mm). The head is shorter in the Indian sample (head in SL 4.31–4.59, \bar{x} 4.49 compared to 4.10–4.31, \bar{x} 4.23). The body depth is less in the

Indian sample (9.47–12.10 in SL, \bar{x} 10.42 compared to 9.02–10.24, \bar{x} 9.62) and the body width is greater (1.35–1.54 in depth, \bar{x} 1.44 compared to 1.56–1.71, \bar{x} 1.60 in the Thai sample). The upper jaw is shorter in the Indian sample than in the Thai sample (upper jaw width in length 0.85–1.05, \bar{x} 0.96 times compared to 1.02–1.14, \bar{x} 1.08; preorbital distance in upper jaw length 1.22–1.38, \bar{x} 1.30 times compared to 1.22–1.52, \bar{x} 1.38). Additional material is needed to determine if these differences have any taxonomic significance.

The two specimens from the Persian Gulf (ZMUC CN-4, 121 mm and USNM 148023, 48.4 mm) differ from the Indian Ocean specimens of *Hy. unicuspis* in several respects but have unicuspid teeth and counts that generally agree with *unicuspis*. The preorbital distance (1.27 and 1.56 in orbit length) is similar to that for *unicuspis* (and *limbatus*) and completely different from *sindensis* (2.0–2.7). The P₂–C distance extended forward falls on the preopercle or preopercle–opercle margin as in *unicuspis* (and *sindensis*), posteriorly on the orbit as in *limbatus*. The smaller specimen fits our concept of *unicuspis* better than does the larger specimen. ZMUC CN-4 has too high a gill raker count (RGR₁ = 36, RGR₂ = 30), too few predorsal scales (33) and vertebrae (31 + 18 = 49) and too short a lower jaw projection (1.11 in head length). The combination of characters suggests that these two specimens represent a differentiated Persian Gulf population of *unicuspis*, an undescribed subspecies of *unicuspis*, or a distinct species. Correct identification of these specimens must await examination of additional material of Indian Ocean *unicuspis* and of the Persian Gulf population that we refer to *unicuspis* for the present.

Etymology.—Named *unicuspis* with reference to the predominantly unicuspid teeth found on both jaws.

Holotype.—USNM 218364; Thailand, S tip of Ko Talibong, 7°11'60"N, 99°22'05"E; V. A. Gallardo, 5th Thai-Danish Exped.; 9 Feb. 1966; 120 mm SL; mature female; D 15, A 16, P₁ 11–11; RGR₁ 10 + 21 = 31; RGR₂ 6 + 19 = 25; predorsal scales 39; vertebrae 33 + 18 = 51; head length 28.0 mm; lower jaw length 30.0 mm; upper jaw length 6.5 mm, width 5.8 mm; P₁–P₂ 42.6 mm, P₂–C 49.2 mm, P₂–C distance extended forward falls on anterior margin of opercle; dorsal fin base 18.6 mm, anal fin base 18.4 mm; orbit length 6.7 mm, preorbital distance 4.3 mm; maximum body depth 13.3 mm, maximum body width 8.4 mm.

Paratypes.—Nine specimens (48.4–144 mm SL) from five collections from the Arabian Sea, Bay of Bengal, and Andaman Sea. USNM 218361 (2, 104–107); India, Kerala, Kottayam; S. D. Trividi. ZSI F1538/2 (1, 138); India, Vaithiluppan, 2 mi N of Pondicherry; 8 Feb. 1958. ZSI 2311/2 (1, 142); India, Madras; Zool. Sur. India. USNM 218365 (4, 84.0–114); same data as holotype. ZIN uncat. (1, 72.6); Bay of Bengal; 20°55'N, 88°02'E; Ob sta. 329; 14 May 1957.

Other material.—Persian Gulf. ZMUC CN-4 (1, 121); Iran, Bushire.

USNM 148023 (1, 48.4); Saudi Arabia, Tarut Bay; D. S. Erdman; April-June 1948.

Acknowledgments

We thank the following curators for making material available to us: R. M. Bailey (UMMZ); M.-L. Bauchot (MNHN); M. Boeseman (RMNH); J. E. Böhlke (ANSP); W. N. Eschmeyer (CAS); C. Gruchy (NMC); K. Hartel (MCZ); R. K. Johnson (FMNH); P. Kailola (DASF); P. Kähnsbauer (NHMV); K. Liem (MCZ); A. G. K. Menon (formerly ZSI); S. P. Monkolprasit (KUB); J. Nielsen (ZMUC); H. Nijssen (ZMA); J. Paxton (AMS); P. Sonoda (CAS); A. N. Svetovidov and V. V. Barsukov (ZIN); A. Wheeler and P. J. P. Whitehead (BMNH). Radiographs were taken by George C. Clipper, drawings were made by Keiko Hiratsuka Moore, and the manuscript was reviewed by Daniel M. Cohen and Robert H. Gibbs, Jr.

Literature Cited

- Bleeker, Pieter. 1852. Bijdrage tot de kennis der Snoekachtige visschen van den Soenda-Molukschen Archipel. Verh. Bat. Gen. 24:1-28.
- . 1866. Revision des Hémirhamphes de l'Inde archipélagique. Ned. Tijdschr. Dierk. 3:136-170.
- . 1871. Scombrésoces. In: Atlas ichthyologique des Indes Orientales Néerlandaises. Amsterdam 6:40-78.
- Collette, Bruce B. 1962. *Hemiramphus bermudensis*, a new halfbeak from Bermuda, with a survey of endemism in Bermudian shore fishes. Bull. Mar. Sci. Gulf Carib. 12(3):432-449.
- . 1965. Hemiramphidae (Pisces, Synentognathi) from tropical West Africa. Atlantide Rep. No. 8:217-235.
- . 1974. The garfishes (Hemiramphidae) of Australia and New Zealand. Rec. Australian Mus. 29(2):11-105.
- . 1976. Indo-West Pacific halfbeaks (Hemiramphidae) of the genus *Rhynchorhamphus* with descriptions of two new species. Bull. Mar. Sci. 26(1):72-98.
- Fowler, Henry W. 1927. Notes on the Philippine fishes in the collection of the Academy. Proc. Acad. Nat. Sci. Phila. 79:255-297.
- . 1935. Zoological results of the third de Schauensee Siamese expedition, Part VI.—Fishes obtained in 1934. Proc. Acad. Nat. Sci. Phila. 87:89-163.
- Günther, Albert. 1866. Catalogue of fishes in the British Museum. Vol. 6:368 pp. Taylor and Francis, London.
- Herre, Albert W. C. T. 1937. Part 1, Marine Fishes. In: Herre, Albert W. C. T. and George S. Myers—A contribution to the ichthyology of the Malay Peninsula. Bull. Raffles Mus., Singapore, No. 13:11-53.
- . 1944. A review of the halfbeaks or Hemiramphidae of the Philippines and adjacent waters. Stanford Univ. Publ., Biol. Ser. 9(2):39-86.
- . 1953. Check list of Philippine fishes. U.S. Fish Wild. Serv. Res. Rept. 20, 977 pp.
- Inger, Robert F. 1957. Report on a collection of marine fishes from North Borneo. Fieldiana Zool. 36(3):341-405.
- Jordan, David Starr, and Robert Earl Richardson. 1900. A catalog of the fishes of the

Island of Formosa, or Taiwan, based on the collections of Dr. Hans Sauter. Mem. Carnegie Mus. 4(4):159-204.

Jordan, David Starr, and Edwin Chapin Starks. 1907. List of fishes recorded from Okinawa or the Riu Kiu Islands of Japan. Proc. U.S. Nat. Mus. 32:491-504.

Parin, N. V., and Yu. N. Shcherbachev. 1972. A new species of halfbeak—*Rhynchorhamphus arabicus* Parin et Shcherbachev (Beloniformes, Hemiramphidae) from the waters of southern Yemen. Voprosy Iktiolo. 12(3):569-571. [In Russian, translation in J. Ichthy. 12(3):523-526.]

Schmidt, P. J. 1930. Fishes of the Riu-Kiu Islands. Trudy Tikhook. Komiteta Akad. Nauk SSSR 1:19-156.

Snyder, John Otterbein. 1913. Fishes of Okinawa, one of the Riu Kiu Islands. Proc. U.S. Nat. Mus. 42:487-519.

Weber, Max, and L. F. de Beaufort. 1922. The fishes of the Indo-Australian Archipelago. E. J. Brill, Ltd., Leiden, vol. 4, 410 pp.

Whitley, Gilbert P., and Alan N. Colefax. 1938. Fishes from Nauru, Gilbert Islands, Oceania. Proc. Linnean Soc. New South Wales 63(3-4):282-304.

Woods, Loren P., and Leonard P. Schultz. 1953. Family Hemiramphidae: halfbeaks. In: Schultz et al., Fishes of the Marshall and Marianas Islands. Bull. U.S. Nat. Mus. 202, vol. 1:166-175.

(BBC) National Marine Fisheries Service Systematics Laboratory, National Museum of Natural History, Washington, D.C. 20560; and (NVP) P. P. Shirshov Institute of Oceanology, Academy of Sciences, Moscow, U.S.S.R.